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Tuna and Billfish Forum Meets for Annual Scientific Assessment

The Sixteenth Meeting of the Standing Committee on Tuna and Billfish (SCTB 16) took place July 9-16 in Mooloolaba, Australia. A forum for scientists and others interested in the tuna and billfish stocks of the western and central Pacific Ocean (WCPO), SCTB annually meets to discuss scientific issues related to data, research and stock assessment. The Commonwealth Scientific and Industrial Research Organisation and Agriculture, Forestry, Fisheries-Australia hosted the forum.

Conclusions

- The 2003 stock assessment shows that the skipjack tuna stock in the WCPO is not being overfished and the stock is not in an over-fished state owing to recent high levels of recruitment and modest exploitation relative to the stock's biological potential.
- The 2003 stock assessment is consistent with the result of the 2002 assessment that the yellowfin tuna stock in the WCPO is presently not being over-fished and the stock is not in an over-fished state. However, the yellowfin stock may be near full exploitation, and future increases in fishing mortality would not result in a longterm increase in yield and may move the yellowfin stock to an over-fished state.
- The current bigeye tuna stock assessment is more pessimistic than 2002 and indicates that over-fishing of the bigeye stock in the WCPO is occurring, but that the stock is not yet in an over-fished state because of high levels of recruitment since 1990.
- South Pacific albacore tuna stocks are unlikely in an over-fished state.
- A common theme throughout the major purse seine fleets was a continued and self-enforced reduction in FAD associated sets due to the tendency of these sets to produce smaller, lower value catch compared to unassociated schools.

SCTB16—Participants and Papers

Participants attending SCTB 16 included representatives from Australia, Canada, Cook Islands, European Union, Federated States of Micronesia, Fiji, France, Indonesia, Japan, Korea, Marshall Islands, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, the Peoples Republic of China, Philippines, Taiwan, Tonga, United States, Vanuatu and Vietnam. Various regional and international organizations, including the Forum Fisheries Agency (FFA), the Inter-American Tropical Tuna Commission (IATTC) and the Secretariat of the Pacific Community (SPC), participated as well.

Electronically monitored, drifting FADs increase catch rates of purse seiners but can shift the catch distribution towards smaller sized tuna, more bigeye and more bycatch species.

SCTB 16 convened as eight groups. The Statistics Working Group (SWG), the Fishing Technology Working Group (FTWG), the Methods Working Group (MWG) held a series of meeting in the two days prior to SCTB16 and considered a range of thematic issues. Also meeting were the Skipjack Research Group (SRG), the Albacore Research Group (ARG), the Yellowfin Research Group (YRG), the Bigeye Research Group (BRG), and the Billfish and Bycatch Research Group (BBRG). The five Research Groups considered regional fishery developments, advances in research, stock assessment and research coordination and planning for their specific species or groups of species. Summaries of these meetings were presented to SCTB16 for discussion.

Crosscutting issues arising from discussion in the three Working Groups and five Research Groups were considered in a separate session of SCTB for the first time. The discussion, which considered issues relating to estimation of catch, catch rates and size/species composition, biological and ecological, stock assessment and emerging management issues, identified certain research issue as priorities with time frames for implementation. Issues identified as being high priority included:

- Better estimates of current catch from Indonesia, Philippines and Vietnam, noting that some progress had been achieved in this area;

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MULTIFAN-CL

MULTIFAN-CL is the primary stock assessment tool used by scientists working in the SCTB context. This important software was recently placed in the public domain and can be obtained at http://www.multifan-cl.org/.

What is a MULTIFAN-CL?

MULTIFAN-CL is a computer program that implements a statistical, length-based, age-structured model for use in fisheries stock assessment. The model is a convergence of two previous approaches. The original MULTIFAN model (Fournier et al. 1990) provided a method of analysing time series of length-frequency data using statistical theory to provide estimates of von Bertalanffy growth parameters and the proportions-at-age in the length-frequency data. The model and associated software were developed as an analytical tool for fisheries in which large-scale age sampling of catches was infeasible or not cost effective, but where length-frequency sampling data were available. MULTIFAN provided a statistically based, robust method of length-frequency analysis that was an alternative to several ad hoc methods being promoted in the 1980s.

How to get MULTIFAN-CL

MULTIFAN-CL and associated programs and documentation are made available to the scientific community free of charge. However, all software and documentation are copyrighted, and availability of the software is subject to a license found at http://www.multifan-cl.org/License.htm that places some minor restrictions on use and distribution. These restrictions permit licensees to distribute unaltered copies of the software, but not derivative works based on it. Licensees are not permitted to use the software for commercial purposes, unless they get the licensor's permission.

In order to download the software from this web site, you will need to agree to these license conditions and register on the form provided. All users are urged to register on the web site so that users may be advised of software developments, viruses and other issues.

The MULTIFAN-CL Development Team encourages user feedback on all aspects of the software and documentation. If you wish to collaborate or suggest how the software might be further developed (and in particular if you have funding or other resources to make it happen), please contact the MULTIFAN-CL Development Team through the web site.

While the MULTIFAN-CL source code is not currently available for downloading, we are happy to provide source code to serious users for development and learning purposes. Contact the MULTIFAN-CL Development Team at http://www.multifan-cl.org/.

The Pelagic Fisheries Research Program is a prime sponsor of MULTIFAN-CL, having funded its initial development and application to yellowfin tuna and subsequent application to bigeye tuna.

- Reconstruction of early catch history (catch, effort, size composition) for all fisheries;
- Further development of methods to standardize effort, including the better use of vessel operational details, environmental data and archival tagging data;
- General efforts to reduce uncertainty in assessments, through improved data inputs, sensitivity analysis and simulations;
- Evaluation of possible regime shifts/changes in productivity and development of improved/alternative estimates of recruitment where possible;
- Development of appropriate formats to frame advice for managers.

The session also reaffirmed the recommendation from previous SCTB meetings that large scale tagging experiments for the main target tuna species in the WCPO be carried out in coordination with tagging experiments in the eastern Pacific Ocean. Participants considered such an experiment crucial to aiding the estimation of movement and fishing mortality rates in the assessment models, providing an independent means of validating model results, and should be regarded as the appropriate regular monitoring approach for highly migratory species in the WCPO.

The Fishery: Catch, Supply, and Prices

The initial overview of western and central Pacific Ocean tuna fisheries noted that the estimated total catch for 2002 for the four main tuna species was 1,982,000 metric tonnes (mt), the second highest annual catch on record after 1998 (2,037,600 mt). The 2002 WCPO catch of skipjack (1,321,900 mt) was the highest ever, eclipsing the previous record catch attained in 1998 (1,314,200 mt) and, as usual, dominated the total catch. Along with the record catches, the price for skipjack tuna has fallen to levels not seen since the 1970s. The WCPO yellowfin catch (438,000 mt; 22%) was the lowest for six years and about 65,000 mt lower than the record catch in 1998 (503,000 mt). The WCPO bigeye catch for 2002 (107,600 mt; 5%) was slightly higher than in 2001, while the WCPO albacore catch (114,500 mt; 6%) was slightly down from that taken in 2001. The record catches for these species are 111,000

mt and 148,000 mt, respectively, taken during 1999. In contrast to the WCPO, the eastern Pacific Ocean (EPO) yellowfin catch for 2002 was the highest ever (427,700 mt), but the EPO bigeye catch was the lowest since 1984.

Recent Trends

Skipjack tuna catches exceed any other tuna species, and a majority of the catch is taken by purse seine. Catches from purse seine sets consist of a mixture of skipjack, yellowfin, and bigeye tuna, with the proportions varying depending on whether sets are made on free schools or floating objects.

Over the past 4-5 years, the catch has been at record high levels exceeding 1.2 million (M) mt annually and accounting for more than 60% of the annual catch of principal tuna species landed from the region. Since about 1996, increased use of fish aggregating devices (FADs) by purse seiners has contributed to the record catches. In 2002, an estimated catch of 1.3 M mt of tuna was landed, the highest on record. Seventy-three percent (962,700 mt) was taken by purse seine gear, 21% (280,600 mt) by pole-and-line gear and 6% (70,000 mt) by other gears.

Nominal catch per unit effort (CPUE) for all purse seine fleets, except the U.S. fleet, continues to show an upward trend, reaching a record high average rate of approximately 30 mt/day fished in 2002. This upward trend is due to increase in efficiency associated with setting on floating objects.

Estimated recruitment has varied (about three fold) since 1972 and the trend has been upward. Estimated current recruitment, although less precise than estimates for earlier year classes, is among the highest in the time series. This high recruitment appears to be related to El Niño events.

Since 1990, there have been large increases in the catches of juvenile yellowfin tuna by the purse seine FAD fishery; however, in recent years catches in the purse seine fishery overall have declined from the record catch taken in 1998. The catches of juvenile yellowfin in the Philippine and Indonesian domestic fisheries have also increased significantly since 1990, with these increases continuing to 2002.

Over the past decade, around 40-60% of the total yellowfin catch in any year has come from the purse seine fishery. In 2002, the total catch of yellowfin tuna in the WCPO is estimated to have been 437,984 mt, the lowest since 1996 and down from the peak catch of 502,960 mt taken in 1998. The relatively low total catch during 2002 was largely due to a decrease in the purse seine catch, which for 2002 was 171,767 mt (39% of the total). This catch was the lowest since 1996.

The low catch rates observed during 2002 are considered unusual for an El Niño event. The longline catches since 1990 (60,000–80,000 mt) have been well below catches taken in the late 1970s to early 1980s (87,000-117,000 mt). The 2002 catch is estimated to be 77,177 mt, or 18% of the catch by all gears. During 2002, the pole-and-line fisheries took 17,770 mt (4% of the total) while "other" fisheries (largely taken by fisheries in the Philippines and Indonesia) accounted for 171,270 mt (38% of the total).

Estimates of the current level of depletion of yellowfin in the WCPO indicate that the current biomass is 20-35% less than the level that would have occurred in the absence of fishing. However, depletion is greater for some regions, notably the equatorial regions where recent depletion levels are near 50%.

The number of purse seine vessels has exceeded 200 since the early 1990s. In more recent years, there has been an increase in the number of vessels flagged by the Pacific island countries while the number of purse seiners in other nationalities has reduced slightly. There had been an increase in purse seine catches of juvenile bigeye tuna associated with the increased use of the drifting FADs during the late 1990s. However, recent catches have fallen to some extent mostly due to a reduced use of drifting FADs since 1999.

Overall longline fleet size has been stable. The number of foreign vessels based in Pacific island countries fell during the past six years, while the number of Pacific island domestic vessels has increased since the early 1990s. The distant-water longline fleet has decreased to some extent and the catch composition in the longline fishery has changed to 30% bigeye, 35% yellowfin, and 35% albacore in 2002, suggesting increased targeting of bigeye as well as albacore.

The total bigeye tuna catch in the WCPO was 108,000 mt in 2002, similar to 2001 and representing 62% of the total Pacific catch in the same year. Available statistics indicate that 60% of the WCPO catch was taken by longline, and most of the remainder by purse seine (21%) and by the domestic fisheries of Indonesia and Philippines and others (18%). The total catch of small bigeye tuna by the purse seine fishery is uncertain, as they are not systematically separated from yellowfin at the unloading sites nor recorded separately on fishing logs.

Purse seine catches in 2002, estimated through the statistical analysis of sampling data, continued to reduce since the 1999 record high of 34,568 mt due to a decreased use of drifting FADs. There is also considerable uncertainty in the estimation of the Indonesian and Philippines catches due to the lack of (or limitations in) systematic sampling programs. Nominal (unadjusted)

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Informing the Political Process (SCG2)

In accordance with the terms of reference agreed by the Preparatory Conference for the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific, the Scientific Coordinating Group (SCG) met July 17-19 in Mooloolaba, Australia, immediately following SCTB16. Dr. Yuji Uozumi chaired the meeting. Matters considered by SCG2 included:

- Review of the updated stock status statements for the major target species (bigeye, yellowfin, skipjack and South Pacific albacore), including implications for sustainability;
- Discussions on gaps in current data;
- Discussions on the impacts of FADs on juvenile tuna stocks in the Convention Area;
- Review of the working papers: Data Standards, Technical Capabilities and Data Sharing Policies for the Western and Central Pacific Region and An Investigation of Technical Capabilities and Data Security and Confidentiality Policies for the Western and Central Pacific Region;
- Development of long-term data needs for the Commission; and,
- Research priorities, research planning, and coordination.

Stock Status of Major Tuna Species

The SCG recognized that the stock assessments used to provide advice on the status of the WCPO stocks are subject to uncertainty in the inputs and model specification and structure. Quantification of the uncertainty associated with stock structure is complex, but is a high priority. They acknowledged the ongoing need for development, testing and review of assessment methods. Several processes are in place to ensure that these development, testing and review activities continue including the work of the methods working group of the SCTB, peer review through cooperation with other organizations involved in stock assessment and formal peer review and publication in the international scientific literature.

In discussing the stock assessments for yellowfin and bigeye stock in particular, the issue of uncertainty is significant in that the true status of stocks may be overestimated or underestimated by current assessments. Significant management implications flow from this uncertainty. In spite of these uncertainties the SCG generally adopted the conclusions of SCTB 16 with respect to stock status and incorporated these conclusions into a report to the Preparatory Conference.

More information on the Preparatory Conference and the Western and Central Pacific Fisheries Commission can be found at http://www.ocean-affairs.com

CPUE for WCPO bigeye tuna derived from longline data indicated a sharp decline during the early stages of the fishery but has been fairly stable over recent years.

The albacore catch in 2002 reached 51,000 mt, which is the second highest in the post-drift net period. Since drift netting ceased in 1992, catches have predominantly come from troll fleets of New Zealand and the U.S. south of 30∞S, and by longliners which fish mainly between 10∞S and 50∞S. Catches from the Pacific Island Country (PIC) longline fleets have increased in recent years. In 2002 these fleets accounted for 50% of the total longline catch. The Taiwanese fleet, which has traditionally targeted albacore and has accounted for the majority of the historical longline catch, recently moved some of its activities to target seasonally northern albacore or bigeye in the equatorial waters of the WCPO. The catch of albacore by this fleet has therefore fallen in recent years.

Condition of WCPO Stocks

Estimated biological reference points indicate that the skipjack tuna stock of the WCPO is not over-fished owing to recent high levels of recruitment and a modest level of exploitation relative to the stock's biological potential. Continued catches at the 1.2 M mt level is sustainable with continued high levels of recruitment, which are believed to be determined by principally environmental factors and not owing to a strong spawner-recruit relationship.

The assessment reviewed by SCTB16 reaffirms the result of the previous assessment that the yellowfin stock in the WCPO is presently not being over-fished and that it is not in an overfished state. However, the stock is likely to be nearing full exploitation and any future increases in fishing mortality would not result in any long-term increase in yield and may move the yellowfin stock to an over-fished state. There may be limited potential to expand long-term catches from the fishery at the current pattern of age-specific selectivity. The assessment also indicates that the equatorial regions are likely to be fully exploited, while the temperate regions are likely to be under-exploited.

While these spatial patterns of exploitation remain uncertain, if true, this may indicate the potential need for different management in different regions. Furthermore, the attribution of depletion to various fisheries or groups of fisheries indicates that the

Indonesian fishery has the greatest impact, particularly in its home region. The purse seine fishery also has high impact, particularly in the equatorial regions.

Bigeye assessments were conducted using several methods of standardizing fishing effort and the assessment results in relation to reference points show considerable variation. However the range in variation presented at SCTB16 include the estimates for presented at SCTB 15. In contrast to the 2002 results, the current assessment concludes that overfishing is occurring but the stock I not overfished due to above average recruitment. Consequently caution should be exercised in contemplating management actions for fisheries exploiting bigeye tuna.

Overall, the longline fishery has had the largest impact on the stock, and later development of the purse seine fishery and increases in the Philippines and Indonesian catch have also had high impact on the stock. In this regard, the assessment results are consistent with those from a Pacific-wide assessment as well as the

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Upcoming Events

21st Wakefield Fisheries Symposium, Assessment and Management of New and Developed Fisheries in Data-Limited Situations

October 22-25, 2003, Anchorage, Alaska
Sponsors: Alaska Sea Grant College Program, AK Dept of Fish & Game, NMFS, North Pacific Fishery Mgt. Council, Wakefield Endowment, & U of AK Foundation. Contact: Sherri Pristash at fyconf@uaf.edu.

Technical Workshop on Reference Points for Tunas and Billfish

October 27-29, 2003, La Jolla, California
Contact: Mark Maunder at mmaunder@iattc.org

Managing Our Nation's Marine Fisheries: Past, Present, and Future

November 13-15, 2003, Omni-Shoreham Hotel and Conference Center, Washington, D.C.
Co-sponsors include the Regional Fishery Management Councils and the National Marine Fisheries Service (NOAA Fisheries). The conference is open to the public and free of charge. Online information: http://www.wpcouncil.org/.

Pelagic Fisheries Research Program, Principal Investigators Workshop

December 9-11, 2003, Imin Conference Center, University of Hawai'i at Mānoa. Featured topic is "Data Rescue: Discovery, Verification, Documentation and Analysis of Long-term Data." Online information: http://www.soest.hawaii.edu/PFRP/.

Northwestern Hawaiian Islands Science Symposium

April 5-9, 2004, Western Pacific Regional Fishery Management Council sponsors. Online information: http://www.wpcouncil.org/.

current status of the stock in the eastern Pacific. The current level of exploitation appears not to be sustainable in the long-term, unless the high recent recruitment is continued in the future.

The fishery for albacore is unique in that it has exhibited no significant trend in catches over the period of 1960–1995. Due to the problems faced by all assessments conducted with limited data on stocks, which have been apparently exploited at only low exploitation rates over the period of the fishery, the results obtained provide little information on the biomass of the stock. Improved results from the MULTIFAN-CL model would be expected if there were better return rates of tags placed on albacore. An analysis based on a Schaefer production model provided an estimate of MSY, but the Group considered that this methodology requires further review before it can be used to provide advice on stock status.

More detailed information on the papers and presentations delivered at the SCTB 16, including billfish and bycatch, fishing technology, methods and statistics, is available online at http://www.spc.int/oceanfish/Html/SCTB/SCTB16/index.htm.

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Modern tuna purse seine vessels can be greater than 100 meters in length and carry over 2500 metric tonnes of frozen catch. The meeting discussed increasing efficiency and harvesting capacity of modern fishing vessels in relation to tuna stock status, research and management.

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